PROCEEDINGS

OF

THE ROYAL SOCIETY.

1830–1831. No. 3.

February 3.

GEORGE RENNIE, Esq. V.P., in the Chair.

The following Presents were received, and thanks ordered for them:—

Catalogue of the Hunterian Collection in the Museum of the Royal College of Surgeons in London, Part II.; comprehending the Pathological Preparations in a Dried State. 4to.—*Presented by the College.*
The Journal of the Royal Institution. No. 2. 8vo.—*The Institution.*
The Philosophical Magazine and Annals of Philosophy. No. 50. 8vo. —*The Editors.*
The National Portrait Gallery. No. 22. 8vo.—*The Proprietors.*
A General History of Birds. By John Latham, M.D. F.R.S. In 10 Volumes 4to.—*The Author.*
Index to the General History of Birds. By John Latham, M.D. F.R.S. 4to.—*The Author.*
Account of the "Traité sur le Flux et Réflux de la Mer" of Daniel Bernouilli. By John W. Lubbock, Esq. V.P. and Treas. R.S. 8vo. —*The Author.*
Refutation of Mr. Palgrave's Remarks; with Additional Facts. By N. H. Nicolas, Esq. 8vo.—*The Author.*

A Paper was read, entitled, "On the Lunar Theory." Communicated by the Rev. Dr. Lardner.

The subject treated of in this paper is introduced by a review of the labours of Clairault, Euler, D'Alembert, and Thomas Simpson. The theories of these eminent men, the author remarks, were very deficient in accuracy, and were not at all adequate, without correction from observation, to the construction of tables. They could serve only to point out the arguments of the equations, and not all even of these. The inequalities of the moon's motion are investigated by approximating processes, which lead to results more or less accurate, according as the approximations are carried to a greater or less extent. The writers above mentioned had contented themselves with short and easy approximations; and though they had accomplished much, had yet left much more to be done. Subsequently to these, Mayer published an elaborate theory of the moon; but his coefficients required much correction, the results of his computations being in some cases found to differ very widely from observation.

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A much greater degree of accuracy was attained by La Place, who bestowed particular attention on the influence of minute quantities in every part of his theory. In the present paper the author has endeavoured to introduce further improvements in the lunar theory, by carrying the approximations considerably further than they have hitherto been made.

In the solutions of the problem given by former mathematicians, the chief obstacle to the attainment of accuracy was the extreme length and labour of the necessary computations. Another object, therefore, which the author has had in view, is to facilitate these computations, and render them less laborious. This he endeavours to effect by the employment of certain artifices, by which the multiplicity of small terms will, with their co-efficients, be reduced within a practicable compass, and their numerical computation rendered less appalling.

The co-efficient of the equation depending on the moon's distance from the sun, affords the means of calculating the sun's horizontal parallax. For this purpose La Place has computed this co-efficient with greater accuracy than the rest; and he makes the sun's parallax nearly 9″. The author's theory gives it little more than $8''\frac{1}{2}$, which is very near the mean of the various results obtained by the observation of transits. He thinks that there is, therefore, great reason to conclude that its true value is about this quantity.

February 10.

DAVIES GILBERT, Esq. V.P., in the Chair.

Sir Philip de Malpas Grey Egerton, Bart. M.P., was elected a Fellow of the Society.

The following Presents were received, and thanks ordered for them:—

Proceedings of the Committee of Science of the Zoological Society. No. 2. 8vo.—*Presented by the Society.*

A Compendious Grammar of the Egyptian Language, as contained in the Coptic and Sahidic Dialects; by the Rev. Henry Tattam:—with an Appendix, consisting of the Rudiments of a Dictionary of the Ancient Egyptian Language in the Enchorial Character; by the late Dr. Young. 8vo.—*The Author.*

Recent Experimental Researches in Electro-Magnetism and Galvanism. By William Sturgeon, Esq. 8vo.—*The Author.*

Conformity with the National Church.—An Answer to "Reasons for Non-Conformity," by John Locke, published in a Life of Mr. Locke by Lord King. (*Anon.*) 8vo.—*The Author.*

Flora Batava. No. 87. 4to.—*His Majesty the King of Holland.*

Nouveaux Mémoires de l'Académie Royale des Sciences et Belles-Lettres de Bruxelles. Tome IV. et V. 4to.—*The Academy.*

Mémoires sur les Questions proposées par l'Académie Royale des Sciences et Belles-Lettres de Bruxelles, qui ont remporté les Prix en 1822–3. Tome IV. 4to.
——— en 1824–5. Tome V. 4to.
——— en 1826–7. Tome VI. 4to.
——— en 1828. Tome VII. 4to.—*The Academy.*
Correspondance Mathématique et Physique, publiée par A. Quetelet. Tome V. 8vo.
——— Livraisons 1 à 6 de Tome VI. 8vo.—*Professor Quetelet.*

The reading of a Paper, entitled, "On a New Combination of Chlorine and Nitrous Gas." By Edmund Davy, Esq. F.R.S. M.R.I.A. Professor of Chemistry to the Royal Dublin Society. Communicated in a Letter to Davies Gilbert, Esq. late President of the Royal Society;—was commenced.

February 17.

DAVIES GILBERT, Esq. V.P., in the Chair.

The following Presents were received, and thanks ordered for them:—

A Manual of Analytical Chemistry. By Henry Rose, Professor of Chemistry at Berlin. Translated from the German by John Griffin. 8vo.—*Presented by the Publishers.*
Tables of Life Contingencies. By Griffith Davies, Esq. 8vo.—*The Author.*
Caii Plinii Secundi Libri de Animalibus cum Notis Variorum, curante J. B. F. S. Ajasson de Grandsagne. Notas et Excursus Zoologici Argumenti adjecit G. Cuvier. 8vo.—*The Editors.*
Aperçu d'un Ouvrage Analytique. Par M. Decajeul. 8vo.—*The Author.*

The reading of Professor Davy's Paper was resumed and concluded.

In the course of his experiments on a new test for chlorine gas, an account of which was lately read to the Royal Society, the author was induced to examine the gases produced by the mutual action of nitric acid and different chlorides, and also of the nitric and muriatic acids on each other. When fused chloride of sodium, potassium or calcium, in powder, is treated with as much strong nitric acid as is sufficient to wet it, a considerable action takes place: cold is produced, and a gas of a bright reddish or yellowish colour is copiously evolved, which is promoted by applying a gentle heat. This gas, especially in the early stage of the process, appears to be a mixture of chlorine and another gas, distinguished from it by the great facility with which it is absorbed by water. From this circumstance, and from its also exerting a considerable action upon mercury, its properties cannot be satisfactorily ascertained by collecting it in contact with either of these fluids; but as it is much heavier than common air, the author was enabled to collect it in sufficient quantity for examination, and nearly in a pure state, from a tubulated retort by means of a bent tube reaching to the bottom of small narrow-mouthed bottles, with ground stoppers.

The gas, when thus obtained, is of a pale reddish yellow colour; has an odour somewhat resembling that of chlorine, though less pungent. From its strong affinity for moisture, it fumes when brought into contact with the air. In its ordinary state of dryness it destroys vegetable colours, readily bleaching turmeric paper: litmus paper, however, is reddened by it before it is bleached. But when carefully dried by means of fused chloride of sodium, it does not affect those substances. This gas does not support combustion; but the bifulminate of silver explodes in it.

The author next describes its action upon phosphorus, sulphur, antimony, arsenic, bismuth, tin, copper, zinc, iron, lead, gold, silver, platina, mercury, sulphuric ether, alcohol, oil of turpentine, naphtha, concentrated muriatic acid, iodine, and bromine. With hydrogen gas it forms a mixture which explodes when ignited.

The general conclusion which the author draws from his experiments is, that this gas is an actual compound of chlorine and nitrous gas, and he therefore gives it the name of the chloro-nitrous gas. When collected over mercury, one portion of it forms with that metal a white compound, which appears to be a mixture of calomel and corrosive sublimate, whilst the remainder is found to give orange vapours with common air, attended with a diminution of volume, and to be almost wholly absorbed by a recent solution of green sulphate of iron. He also infers that the gas consists of equal volumes of chlorine and nitrous gas, combined together without any condensation, its atomic number being 102. He finds its specific gravity, compared with that of atmospheric air, to be 1.759.

In the mutual decomposition of chloride of sodium and nitric acid, the products appear to be chloro-nitrous and chlorine gases, and nitrate of soda. The author explains the changes which take place in the following manner:—the nitric acid, by its partial decomposition, yields nitrous gas and oxygen: the former unites with part of the chlorine expelled from the chloride of sodium, to form chloro-nitrous gas, whilst the latter combines with the sodium to form soda, which, with the remaining nitric acid, compose nitrate of soda. The remainder of the chlorine mixes with the chloro-nitrous gas.

The author states that the two component gases of the chloro-nitrous gas unite at once when brought into contact, after having been dried in the most careful manner possible; a fact which is contrary to the opinion generally entertained among chemists.

By passing chloro-nitrous gas through water an acid is obtained, which appears to resemble very closely the common solvent of gold, or *aqua regia*, otherwise called the nitro-muriatic acid. The author here remarks, that if the constitution of the chloro-nitrous gas be such as he has stated, that is, composed of 30 by weight of nitrous gas, and 72 of chlorine, one of its proportionals should decompose two of water, consisting of 16 oxygen and 2 hydrogen; thus forming 46 nitrous acid, and 74 muriatic acid. But an acid so constituted should be incapable of acting on gold or platina; now the acid resulting from the absorption of chloro-nitrous gas by water has this power.

The author concludes from his experiments, that the power of nitro-muriatic acid in dissolving gold is not owing to the liberation of chlorine, and that muriatic acid may be separated from nitric acid, even when the latter is only half the volume of the former. He regards chlorine and chloro-nitrous gases as the gaseous products arising from the mutual action of strong nitric and muriatic acids on each other. The nitro-muriatic and chloro-nitrous acids strongly resemble each other in their action on platina, though the solvent power of the latter is decidedly greater than that of the former; and the addition of water considerably increases this power in both, probably by counteracting their disposition to assume the elastic state. Both acids form, with different bases, salts which are mixtures of nitrates and chlorides. The principal differences in these acids may arise from their mode of preparation, and is probably due to the want of uniformity in their composition.

February 24.

DAVIES GILBERT, Esq. V.P., in the Chair.

The Bishop of Chichester; John Lee, LL.D.; and Isaac Wilson, M.D.; were elected Fellows of the Society.

The following Presents were received, and thanks ordered for them:—

Memoir of the Life of Thomas Young, M.D. F.R.S.: with a Catalogue of his Works and Essays. 8vo.—*Presented by Mrs. Young.*

An Enquiry respecting the Site of the Battle of Mons Grampius. By Lieut.-Col. Miller, C.B. F.R.S. 4to.—*The Author.*

An Engraved Portrait of Charles Wilkins, Esq. LL.D. F.R.S. Engraved by J. Sartain from a painting by T. G. Middleton.—*William Marsden, Esq. F.R.S.*

Bulletin de la Société Géologique de France. Tome premier. 8vo. —*The Society.*

A Paper was read entitled, "On the Chemical Action of Atmospheric Electricity." By Alexander Barry, Esq. F.L.S. Communicated by J. G. Children, Esq. Sec. R.S.

A kite was raised in an atmosphere which appeared favourable to the exhibition of electrical phenomena, from an apparatus firmly fixed in the earth, and insulated by a glass pillar. The string to which it was affixed contained a double gilt thread, and was let out to a length of five hundred yards. It was connected with a platina tube passing about half way down a glass tube full of a solution of sulphate of soda, coloured with syrup of violets, and inverted in a cup containing the same liquid. A similar wire in another tube, also filled with the coloured solution, was placed in communication with the earth, and the fluids in each made to communicate by a bent glass tube passing from one cup to the other. The result of the experiment was, that hydrogen gas and alkali were developed in the first tube, and oxygen gas and acid in the latter.

The reading of a Paper, entitled, "An Account of Operations carried on for ascertaining the Difference of Level between the River Thames at London Bridge and the Sea: and also for determining the Height above the Level of the Sea, &c. of intermediate points passed over between Sheerness and London Bridge." By John Augustus Lloyd, Esq. F.R.S.;—was commenced.

March 3.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX,

President, in the Chair.

The Rev. Robert Walker, M.A. was elected a Fellow of the Society.

The following Presents were received, and thanks ordered for them:—

Illustrations of Indian Zoology. Part V. Folio.—*Presented by John E. Gray, Esq.*

Illustrations of Mr. Cooper's Surgical Dictionary. Parts IV., V., and VI. 8vo.—*W. P. Cocks, Esq.*

Notice of the Proceedings of the Geological Society. No. 18. 8vo. —*The Society.*

The Philosophical Magazine and Annals of Philosophy. No. 51. 8vo.—*The Editors.*

The Christian's Magazine, or Weekly Miscellany of Religious Essays, Anecdotes, Literature, Biography, Intelligence, and Poetry. No. 1. 8vo.—*The Editor.*

National Portrait Gallery. No. 23. 8vo.—*The Proprietors.*

A Vade Mecum of Morbid Anatomy, Medical and Chirurgical; with Pathological Observations and Symptoms. Illustrated by upwards of Two Hundred and Fifty Drawings. By W. Money. Second Edition. 8vo.—*The Author.*

The reading of Mr. Lloyd's Paper was resumed and concluded.

The author of this paper received directions from the Lords Commissioners of the Admiralty, in February 1830, at the suggestion of the Royal Society, to survey the river Thames, with a view of ascertaining the difference of level between certain parts of it and the mean level of the sea near Sheerness. Having had experience, while employed in a survey of the Isthmus of Darien, of the great imperfections in the levelling instruments hitherto used, he bestowed great pains in improving the construction of those employed in the present survey; endeavouring to combine the properties of great steadiness and accuracy of motions in azimuth, with increased delicacy in the level, and permanence in the general position of the whole apparatus; and also to increase the power of the telescope. The author then enters into a full description of the improved instruments which he employed, accompanied by drawings.

As soon as he was furnished with the proper means of observing, he commenced his operations at Sheerness in the month of March. The principal object of his commission being to ascertain the heights of different places above the level of the sea, it became necessary, in the first place, to estimate the heights of the tide; and accordingly, having obtained permission from the Admiralty to erect a tide gauge at the Dock Yard at Sheerness, he selected a corner of the boat basin as the most eligible spot for this purpose: having accomplished this object, he next directed his attention to the establishment of a standard mark, from whence, as from a zero point, the levellings might be reckoned. Considerable difficulty was met with in fixing upon a spot in every respect adapted to this object; for all the buildings in the immediate vicinity of the tide gauge appeared to be deficient in the security of their foundation. He at length selected a large block of granite in the southern pier of the entrance to the boat basin. He then caused a block of gun metal, cast for the purpose, two inches and a half square and eight inches long, to be sunk in the centre of the granite, about an inch below the surface, thereby allowing a brass box and cover to be placed over the standard to protect it from injury. In order that there might be a sufficient number of checks to the permanence of this standard mark, the author caused others to be placed in the yard; namely, one near the southern extremity on the wall of the Dock Yard, one at the eastern side of the great basin, and one in a large block of stone resting on the brick-work of the navy wall. As a further means of future verification of this standard level, he had a very large block of granite placed on a slight eminence, two miles and a half to the southward of the Dock Yard, on which there formerly stood the old castle of Queenborough. One of the brass standards being let into the granite, the place was covered over, but marked by a small mound of earth near it, so that it may easily be referred to whenever it may be thought requisite.

From a series of observations made at Sheerness in the years 1827, 1828, and 1829, it is found that the mean high-water spring tides was 26·355 feet, low-water spring tides 8·74; mean 17·649. The mean high-water neap tides 22·656, low-water 11·336; mean 16·993. The mean of the whole period being 17·27.

The author then states the results of the successive levellings he took from Sheerness along the course of the river to London Bridge. On his arrival at Greenwich Hospital, he commenced a set of branch levels from thence to the Royal Observatory, for the purpose of determining its height above the level of the sea,—an operation which was rendered tedious by the abruptness of the ascent. Having completed these observations, it occurred to the Astronomer Royal that the instruments employed in the survey might be used as a means of verifying the correctness of the horizontal point of the mural circles. The coincidence of the horizontal wires of the two instruments was found to be so nearly perfect, as to agree within a few hundredths of a second. From Greenwich the levelling was continued on the opposite side of the river to different places where tide-registers had been kept. By the kindness of Mr. Lubbock, the author was furnished with the results of twenty-six years' observations on the tides at the London Docks; from which it appears, that the height of mean high-water mark there, above that at Sheerness, is 2·24 feet and the height of spring tide high-water mark 2·03, and of neap tides 2·35. The Trinity mark on the western side of Old London Bridge is 2·16 feet below the north standard mark at Sheerness, and 1·9 foot above the mean spring tide high-water mark at Sheerness.

The author concludes by giving a long catalogue of standard marks and other points of reference between Sheerness and London Bridge, the north standard at Sheerness being taken as the zero point.

In the course of his observations he found reason to believe that the tremulous appearance of the air which has been termed *mirage*, is caused, not so much by evaporation as by the direct effect of the solar rays: for he remarked, that when there was a succession of clouds passing over the sun, the tremor was very great at those times when the sun shone; but the moment the sun was obscured over the whole space between the instrument and the object viewed, the air was perfectly tranquil.

March 10.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX,
President, in the Chair.

Alexander Caldcleugh, Esq. and John Carnac Morris, Esq. were elected Fellows of the Society.

The following Presents were received, and thanks ordered for them:—

An Engraved Portrait of Davies Gilbert, Esq. V.P.R.S. Engraved by Cousins from a painting by Howard.—*Presented by John Guillemard, Esq. F.R.S.*

Notices of the Proceedings of the Zoological Society. (Jan. 25 to Feb. 8, 1831.) 8vo.—*The Society.*

It being stated to the Meeting by the President that Mr. Caldcleugh, elected that evening, was on the point of leaving England for Mexico, and would consequently have no other opportunity during this session of attending for admission, Mr. Caldcleugh was allowed to sign the Obligation in the Charter Book, and was admitted a Fellow of the Society.

A Paper was read, entitled, "Description of a Graphical Register of Tides and Winds." By Henry R. Palmer, Esq., Civil Engineer. Communicated by J. W. Lubbock, Esq. V.P. & Treas. R.S.

The author having long directed his attention to the effects likely to be produced on the tides in the river Thames, in the port of London, by the removal of London Bridge, was desirous of obtaining a series of accurate observations during all the changes of the tides; and for this purpose constructed a machine, which, being acted upon jointly by a time-piece and by a float resting on the water, registered of itself, upon a piece of paper, both the height of the tide, and the direction of the wind.

A number of parallel and equidistant lines, representing feet in height, are engraved and printed on long sheets of paper, the ends of which are joined together until a sufficient length is obtained for the purpose required. This long sheet is wound upon a brass roller, which is placed near the lower part of a cylinder one foot in diameter, so that the paper may pass round it; its contact being preserved by a roller above, pressing upon it by its own weight. On the axis of the cylinder is a toothed wheel, which is acted upon by a clock, producing an equable motion in the cylinder, which is thus made to complete one revolution in six hours. By means of another wheel, at the expiration of every hour a hammer is raised, whose fall strikes on an upright punch connected with a weather-cock on the top of the building; and the figure of an arrow being cut on the lower end of this punch, an impression of the arrow is made upon the paper: as the direction of the arrow always corresponds with that of the wind, the direction of the latter is thus hourly registered.

Immediately over the axis of the cylinder, and parallel with it, is a rack carrying a pencil. The rack is acted upon by a pinion, which receives its motion from the float on the water: so that as the tide rises or falls, the pencil is moved backwards and forwards through a space which bears a determinate ratio to the actual rise or fall of the float: and thus, by the combined motions of the cylinder and of the pencil, the one regulated by the clock and the other by the tide, a line is traced on the paper, giving a representation of both.

The float, which rests on the water, is a hollow plate-iron vessel, suspended by a chain, which passes twice round a light cast-iron barrel, and then descends, having a counter weight attached to it. The float is placed in a well communicating with the river, through a fine wire gauze, which prevents the undulations of the surface from affecting the water in the well.

The author concludes by an account of an application of similar machinery to the determination of the precise times of high water, and the construction of accurate tide tables. He proposes, with this view, an instrument which shall record the height of the tide at every minute, and promises to give to the Society a full description of such a machine when it shall have been completed.

His Royal Highness then addressed the Meeting, informing them that by the express command of His Majesty, He, together with the

Council of the Society, had that morning waited upon His Majesty at St. James's Palace, for the purpose of witnessing the inscribing of the Royal Signature in the Charter Book of the Society, conformably with the intention which His Majesty had been graciously pleased to express through the Right Hon. Robert Peel, the Secretary of State for the Home Department, in answer to an Address presented to His Majesty by the President and Council, in the name of the Society, in the month of July last.

His Royal Highness stated that he on this occasion addressed the King to the following effect:

"Sire,

"May it please Your Majesty,

"The President and Council of the Royal Society, instituted for the promotion of natural knowledge, in obedience to your commands, now appear in Your Majesty's presence, and humbly crave your gracious permission to lay before you the Volume of their Registry for the insertion of your Royal Signature as Patron of their Institution. Under the fostering care of Your Majesty's predecessors this Society has constantly laboured for upwards of one hundred and seventy years in the pursuit of those objects for which it was originally instituted. This further proof of Your Majesty's favour and patronage will give an additional stimulus to our exertions in the promotion of natural knowledge.

"While we venture once more to return you our most humble and sincere thanks for the assurances it has pleased you, Sire, to give to us of enjoying your Royal Favour, may we be permitted, in unison with all classes of Your Majesty's faithful and loyal subjects, to offer up our most fervent prayer to the Ruler of all Princes and Kingdoms, for the health, the prosperity, and the happiness of our Most Gracious Sovereign, the patron of every charitable, scientific, and liberal institution."

To this address His Majesty was pleased to return a most gracious answer; expressing the high sense he had always entertained of the value and importance of science in conducing to the prosperity, the happiness, and the glory of nations,—an opinion which he had been led to form in early life by witnessing, while engaged in the service of his profession in the navy, the immense practical advantages which result from the cultivation of science; and assuring the Society of his earnest desire to promote their objects and foster their exertions in so excellent a cause as that in which they are engaged; and of his anxious wish that they should cordially cooperate with the scientific and learned men of other countries in the same laudable endeavours to enlarge the boundaries of human knowledge.

His Majesty signed his name, in a leaf prepared for the purpose, in the Charter Book, as Patron of the Royal Society.

The Members of the Council were then severally presented to His Majesty by His Royal Highness, and had the honour of kissing His Majesty's hand.

His Royal Highness proceeded to state, that himself, attended by the Council, had afterwards the honour of presenting the following Address to Her Majesty, by whom they were most graciously received.

"To the Queen's Most Gracious Majesty,

"May it please Your Majesty,

"As President of the Royal Society of London for improving natural knowledge, permit me, Madam, on behalf of that body, to lay before Your Majesty an humble but sincere avowal of the deep respect and entire attachment which every Member of our Society entertains for Your Majesty's most gracious person, for the Royal and illustrious Consort of our beloved and venerated Monarch, His Most Gracious Majesty King William the Fourth.

"It is not, perhaps, unknown to Your Majesty, that the Society over which I have the honour to preside, was incorporated in the reign of King Charles the Second; and, by the especial favour of that monarch, it was designated The Royal Society,—a distinction which every succeeding monarch of these realms has been pleased to continue.

"A sense of duty and gratitude has led us, in the first instance, to offer up our tribute of condolence and congratulation to the King's Most Excellent Majesty, on the demise of our late revered Sovereign, and upon his own accession to the crown of his ancestors.

"Having discharged this duty to our Patron, and having just obtained his Royal Signature, we now venture to request Your Majesty's powerful support and cheering protection; and that Your Majesty will be graciously pleased to receive us into your Royal Favour. Our humble expectations rest on the ground of public utility. The great object of our Institution has been, and will, we trust, long continue to be, the promotion of natural science in all its branches. With our success in this respect, the prosperity of our common country is closely and indissolubly connected.

"Accept then, Royal Madam, the assurances of our duty and allegiance; and suffer us, in conclusion, to express our warmest wishes for Your Majesty's uninterrupted welfare and peace.

"May the great Giver of all good pour down his blessings on your royal person! May it be consistent with the wise and merciful dispensations of his Providence, that, together with Your Majesty, our generous and beloved Sovereign may long continue to watch over the interests, and to direct the labours, of a free, loyal, and united people!"

To which Her Majesty was pleased to return the following most gracious answer.

"I thank you very cordially for your expressions of affectionate attachment towards myself, and dutiful congratulations towards the King, on his accession to the throne of his ancestors.

"Firmly convinced as I am that the diffusion of natural science, guarded and protected by religion and morality, must be conducive to the prosperity of this country, the President and Fellows of the Royal Society may always depend upon my countenance and approbation, as I am convinced they will receive the support and protection of the King."

The Members of the Council were then severally presented to Her Majesty by His Royal Highness, and had the honour of kissing Her Majesty's hand.

March 17.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX,
President, in the Chair.

The Rev. Thomas Smith Turnbull, M.A.; Christopher R. M. Talbot, Esq.; and Henry Fox Talbot, Esq.; were elected Fellows of the Society.

The following Presents were received, and thanks ordered for them:—

The Nautical Almanac and Astronomical Ephemeris for the Year 1833. 8vo. (3 Copies.)—*Presented by the Lords Commissioners of the Admiralty.*

Second Supplement to an Essay on the Theory of Systems of Rays. By W. R. Hamilton, Esq. 4to.—*The Author.*

On the Error of a received Principle of Analysis, respecting Functions which vanish with their Variables. By the same. 4to.—*The Author.*

Address of Earl Stanhope, President of the Medico-Botanical Society, for the Anniversary Meeting, Jan. 1831. 8vo.—*The Author.*

A Catalogue of Books in the Library of the Company of Clockmakers of the City of London. 8vo.—*The Company.*

Kongl. Vetenskaps-Academiens Handlingar, för år 1827. 8vo.

—————— för år 1828. 8vo.—*The Academy.*

Register öfrer Kongl. Vetenskaps-Academiens Handlingar, ifrån och med 1813, till och med 1825.—*The Academy.*

Årsberättelser om Vetenskapernas Framsteg, afgifne af Kongl. Vetenskaps-Academiens Embetsmän, d. 31 Mars 1828.—*The Academy.*

Memorie della Reale Accademia delle Scienze di Torino. Tomo XXXIV. 4to.—*The Academy.*

Handleiding tot het Vinden der Ware Sterkte van het Acidum Aceticum door vande Digtheid. Na voorafgegane Proeven opgesteld door A. van der Toorn. 4to.—*The Author.*

A Paper was read, entitled, "Proposed Plan for supplying filtered Water to the Metropolis and its Suburbs." By Lemuel Wellman Wright, Esq., Civil Engineer. Communicated by T. J. Pettigrew, Esq. F.R.S.

The author, after giving extracts from the Report of the Commissioners appointed by His late Majesty to inquire into the supply of water to the metropolis, in support of the practicability of affording a supply of filtered water from the Thames, adequate to the demand, and within reasonable limits in point of expense, proposes his plan of forming a filter under the bed of the river for each Company. He states that the deposit of mud on each side of the Thames does not reach below the low-water mark, and that the bed of the river throughout is generally a clean and strong, though porous gravel. The mud, therefore, will puddle in, and close the pores of the bed of gravel on which it lies, above low-water mark, so that the filtration into the neighbouring wells, the waters of which are remarkably pure, must take place below low-water mark. He therefore proposes to construct a filtering chamber below the bed of the river, from which chamber a main pipe or tunnel must be made for conducting the filtered water into a well on the river side, whence it is to be drawn up by steam power, and distributed to the houses to be supplied, by the mains and branches at present existing.

The filtering chamber and apparatus are to be prepared by erecting a coffer-dam in the river, of sufficient size to inclose the whole of the area required for that purpose. This coffer-dam will require piles of forty-five feet in length. The bed of the river, thus laid dry, is to be dug out, and a bed of brick-work, set in cement, laid down: a floor must then be constructed in the form of an inverted segment of an arch. On the top of the walls of this floor, plates are to be laid, and in the inclosed area, granite blocks placed; upon these again, the girders are to be laid, and over these the joists, which are to support a first layer of large flints. Upon these, successive layers of smaller flints are to be laid, each decreasing in size as they approach the bed of the river. Upon the uppermost of these, a stratum of clean shingle is to be deposited; then a bed of fine and very clean gravel; and lastly a bed of filtering sand, until it arrives within a foot of the bed of the river, which last space must then be filled up with clean gravel; thereby forming a filtering bed of eight feet in depth, the top of which will still be four feet below low-water mark. So that, allowing seven feet for the timbers and brick-work below, and eighteen feet for the rise and fall of the tide, the total depth at high-water will be thirty-seven feet.

The paper is accompanied by a lithographic drawing, which exhibits the several parts of the scheme.

A Paper was read, entitled, "On the Variable Intensity of Terrestrial Magnetism, and the Influence of the Aurora Borealis upon it." By Robert Were Fox. Communicated by Davies Gilbert, Esq. V.P.R.S.

The author gives the results of a series of observations on the vibrations of the magnetic needle, which he undertook last summer, for the purpose of ascertaining whether the intensity of its directive force is affected by the changes in the earth's distance from the sun, or by its declination with respect to the plane of its equator. He observed that the magnetic intensity is subject to frequent variations, which are sometimes sudden, and of short duration. These anomalies he has been unable to refer to any obvious cause, except when they were accompanied by the appearance of the aurora borealis, which evidently affected the needle on many occasions. He also thinks that the vibrations of the needle became less rapid with a moist atmosphere, and more so when it was very dry. Changes of the wind and snow storms appeared also to be attended with fluctuations in the intensity of the magnetism. He endeavoured to ascertain whether there existed any decided and constant difference in the directive force of each pole; conceiving that, on the hypothesis of a central magnetic force, the north pole of the magnet would, in these northern latitudes, be acted upon with much greater energy than the south pole. From his observing that the relative intensity of the two poles is not always the same, he infers the probability of the earth's magnetism being derived from the agency of electric currents existing under its surface as well as above it, and that the rapid fluctuations in its intensity are owing to meteorological changes.

The author is led to conclude that the aurora borealis is an electrical phenomenon, and that it usually moves during the night nearly from north to south, and in an opposite direction during the day; that it is of the nature of positive electricity; and that its elevation above the earth is much greater than a thousand, and perhaps thousands of miles.

Printed by Richard Taylor, Red Lion Court, Fleet Street.